

NOTES ON AUSTRALASIAN ANISOPODIDAE (DIPTERA).

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(Thirty-eight Text-figures.)

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The family Anisopodidae (Rhyphidae) is rather poorly represented in the Australasian region. Two species, *Anisopus dubius* Macq. and *A. neozelandicus* Schin., are known from Australia and Tasmania; one, *Anisopus hellwigi* de Meij., from New Guinea; one, *Olbiogaster insularis* Tonn., from Lord Howe Island; and four species have been described from New Zealand. There is no published information about the life-histories of any of these species. In fact, it was not until Keilin (1928) gave a detailed description of the early stages of *Anisopus fenestralis* Scop. and *Olbiogaster africanus* Edw. in "Genera Insectorum" that an adequate account of the larvae of any species of these genera was published.

In the present paper *Anisopus funebris*, n. sp., and the hitherto unknown male of *Olbiogaster insularis* Tonn. are described, and descriptions are given of the early stages of *Anisopus dubius* Macq., *A. funebris*, n. sp., and *O. insularis*.

The writer is indebted to Mr. A. L. Tonnoir for material, advice, and assistance in preparing this paper, and to Miss V. Irwin-Smith for material and notes.

OLBIOGASTER INSULARIS TONN.

Mr. A. L. Tonnoir named this species from a solitary female from Lord Howe Island in 1923. The larvae, which were identified by Mr. Tonnoir by a male fly bred from them, were collected by Miss V. Irwin-Smith on Lord Howe Island in February, 1934. Two of the larvae, collected on 23rd February, were examined on 21st March, when one was found to have pupated and produced a fly, whilst the other was still larval. On 6th April this second larva had pupated and the fly emerged on 9th. Notes made by the collector state that the larvae were very numerous in the debris inside decayed and rotten logs. It is of interest to note that the three other species of *Olbiogaster* whose life-histories are known, from Brazil, Trinidad and West Africa respectively, were all recorded from rotten wood.

Description of Adult.

♂.—Length 7 mm.; wing 5.5 mm.; antennae 4 mm.

Head black, mouth parts testaceous; occiput with sparse long yellow hairs; scape of antennae orange, flagellum black with a greyish pruinosity, covered with short black bristles.

Thorax black with yellow striations, humerus yellow, scutellum yellow; thorax clothed with fine yellow hairs; halteres light brown with yellow stems. Legs yellow, shading to darker on tarsi; posterior coxae slightly stained brown; hind tarsi darker than others; legs covered with minute brown spines; anterior tibiae with one spur, the others with two; spurs yellow.

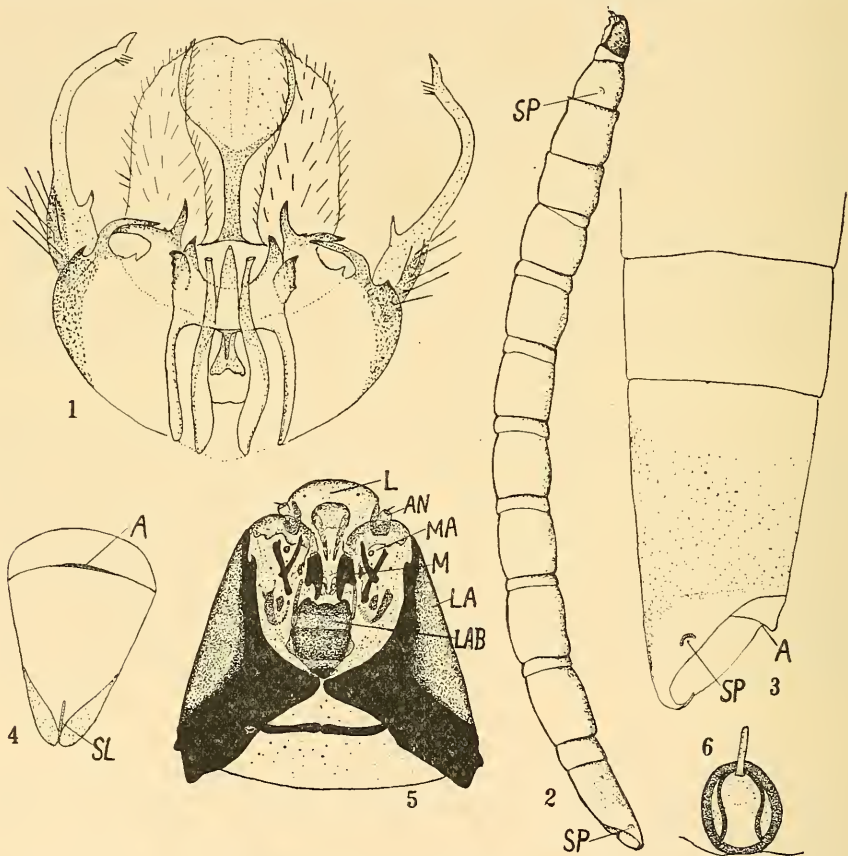
Wings bare, iridescent with a very faint brownish tinge, stigma smoky-brown. Venation the same as in female.

Abdomen narrow and elongated; the first five segments yellow on anterior half and black on posterior half, giving the abdomen a series of transverse stripes. Terminal segments black. Abdomen covered with fine yellow hairs. Genitalia as figured (Text-fig. 1). Except for some small differences in detail the male shows a close resemblance to the female as described by Tonnoir.

Bred from larva collected in rotten wood on Lord Howe Island on 23rd February, 1934, by Miss V. Irwin-Smith. The allotype male is in the collection of the Division of Economic Entomology, Canberra.

The Larva (Text-fig. 2).

The full-grown larva measures from 16 to 18 mm. in length. It is narrow, cylindrical and vermiform. All the segments are approximately the same width,



Text-figs. 1-6.—*Olbiogaster insularis*.

- 1.—Male hypopygium, $\times 60$. 2.—Larva, $\times 7$. *sp*, spiracles. 3.—Posterior end of larva, $\times 26$. *a*, anus; *sp*, spiracle. 4.—Anal plate, $\times 43$. *a*, anus; *sl*, slit. 5.—Head of larva, ventral surface, $\times 60$. *an*, antenna; *l*, labrum; *la*, lateralium; *lab*, labium; *m*, mandible; *ma*, maxilla. 6.—Antenna, $\times 290$.

the first and last tapering to the extremities. The last segment is noticeably longer than the others. The colour of the larva is uniformly white, except for the last segment, which has a smoky tinge on the posterior third. The free head-capsule is brown. The skin is quite smooth and shining. Both pairs of spiracles are external and visible. The anterior pair are borne laterally on the first thoracic segment and appear as tiny brown half-circles. The posterior pair are on the eighth abdominal segment, dorso-lateral in position, and a short distance from the apex. They are also semicircular in outline and light brown in colour.

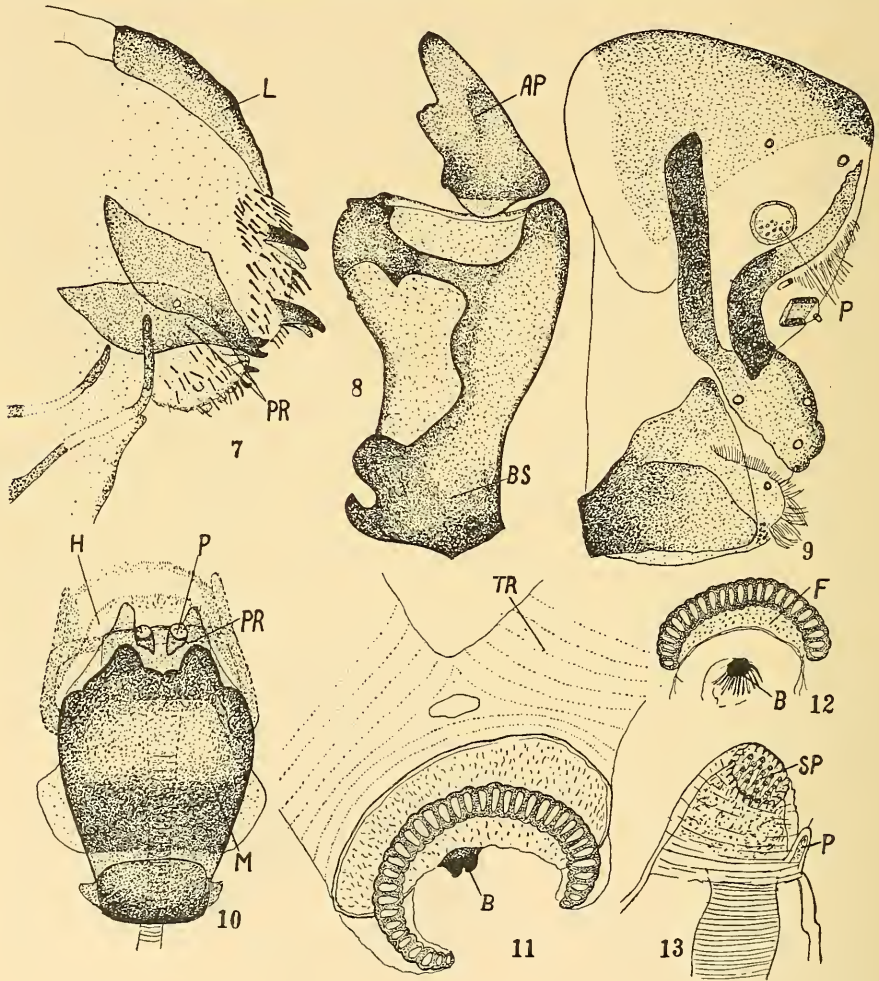
The segmentation is distinctive. There are three thoracic segments and nine abdominal. Between each of the abdominal segments, except the eighth and ninth, is a secondary annulation. The junction between both primary and secondary segmentation is marked by a slight overlapping of the skin. The annulation between the seventh and eighth segments is wider than the others.

The first to the seventh abdominal segments are all similar. The eighth is about one and a half times the length of the others and tapers towards the posterior end (Text-fig. 3). It is cut away sharply in the posterior third and produced to a ventrally hooked process, which curves around the ninth segment at the extreme apex of the body. The ninth segment is small and entirely latero-ventral. The anus appears as a lipped cleft about a third the distance from its anterior edge. The whole sclerite may be detached as a plate (Text-fig. 4) bearing the anal opening, and a little posterior notch where the prolongation of the eighth segment fits in.

The head (Text-fig. 5).—The head capsule is complete and, from a dorsal aspect, is oval in shape. It consists of the prefrons, which is narrow and pointed at its posterior end, widening towards the anterior and ending in the labrum. Each side of this are the lateralia, large roughly triangular sclerites which curve round the sides of the head. The points of the lateralia meet ventrally behind the mouth-parts, and their ventral margins are banded with heavy black chitin. On the dorsal surface of each, in its anterior half, is a small depression with an irregular dark spot in its centre, representing the rudimentary eye. Anterior to these and close to the base of the labrum are the antennae (Text-fig. 6). Each consists of a large globular basal segment and a small elongated pencil-like apical segment, very similar to the antennae of *O. africanus*. The tentorium consists of a pair of bars arising from the posterior ventral edge of the lateralia and directed backwards and inwards, meeting to form an arch inside the head. There are no longitudinal rods.

Mouth-parts.—The labrum (Text-fig. 7) is fairly strongly chitinized, being the anterior curved extremity of the prefrons. On its ventral side it continues into the epipharynx, which bears two pairs of large blunt spines near the apex. In the same area are numerous small sharp spines. Laterally behind the apex are the "premandibles" (Goetghebuer, 1925), which are large, roughly triangular in shape, not very heavily chitinized and bearing a single tooth apically. Keilin refers to the premandibles as "comb-like chitinous plates", and states that *Olbiogaster* is devoid of these. Below and between the premandibles the epipharynx bears numerous hairs and sensory papillae. There is a chitinous support associated with this part and known as the U-shaped piece. The mandibles lie each side of the labrum, and in the resting position are folded inwards close together and pointing posteriorly. When extended they project in front of the head. The mandibles (Text-fig. 8) are remarkable in that they

are jointed, each consisting of two segments. The basal segment is a large elongated sclerite which is most heavily chitinized on its curved exterior edge and at the basal extremity. There is also a strong piece of chitin on its inner edge anteriorly. There are two deep bays or indentations in the sclerite, one being anterior and the other on the inner edge. Joined at the outer anterior edge is the apical segment, consisting of a small thick plate with a large blunt tooth apically, and a smaller one on the inner edge. The mandibles of *O. africanus* also consist of two parts, the apical part bearing three teeth.



Text-figs. 7-13.—*Olbiogaster insularis*.

7.—Labrum-epipharynx, $\times 290$. *l*, labrum; *pr*, premandibles. 8.—Mandible, $\times 290$. *ap*, apical segment; *bs*, basal segment. 9.—Maxilla, $\times 290$. *p*, palp. 10.—Labium, $\times 180$. *h*, hypopharynx; *m*, mentum; *p*, palp; *pr*, prementum. 11.—Posterior spiracle, $\times 330$. *b*, button; *tr*, transverse trachea. 12.—Anterior spiracle, $\times 330$. *b*, button; *f*, felt-chamber. 13.—Pupal breathing horn, $\times 95$. *sp*, spiracle; *p*, papilla.

The maxillae (Text-fig. 9) are large, somewhat elongated and comparatively lightly chitinized. The inner edge is curved and bears a tuft of fine hairs associated with which is a short broad papilla. Above this on the lower face of the maxilla is another papilla in the form of a circular mound bearing numerous tiny sensillae. The base of the maxilla is occupied by a curved chitinous plate, near the inner edge of which is a fringe of fine hairs and an area of minute papillae. There are two large chitinous bars in the maxilla, one curving parallel with the inner edge and the other running diagonally with a sharp curve near the bottom, and ending in a regular chitinous mass containing three small holes. This structure projects out on the inner edge of the maxilla near its base.

The labium (Text-fig. 10) is strongly developed in *Olbiogaster*. It consists of a large heavily-chitinized plate which, at its anterior end, is produced into two lobes, and posteriorly ends in a small rounded mass of chitin, with a pair of wing-like flanges. The main body of the plate, which is probably the mentum, also bears a lateral pair of flanges. Attached to, and in front of, this sclerite is a small, thinner plate bearing two large palp-like sensory organs. This represents the prementum. The hypopharynx is closely associated with the labium. It is attached to the dorsal surface of the mentum and projects upwards and forwards into the head. It is a delicate plate with a supporting border of strong chitin and a pair of trabeculae running forwards above the prementum. It bears delicate fringes and rows of hairs.

The spiracles.—The posterior spiracles (Text-fig. 11) each consist of a single curved slit which assumes a C shape, with the opening of the C facing backwards and slightly outwards. The slit has a scalloped chitinous border and is crossed by a regular series of bars. In the hollow of the curve is a small irregular chitinous mass, the button or scar. Below the spiracle is a short felt-chamber. There is a transverse tracheal trunk connecting the two posterior spiracles and joining the main lateral trunks just behind the felt-chamber. The anterior spiracles (Text-fig. 12) also consist of a single slit curved into a crescent shape and smaller than the posterior spiracle. It is of the same construction with a similar button and felt chamber.

The pupa.—No complete pupae were available, but an examination of the pupal skins shows that it is quite distinct from the pupa of *Anisopus*. It is much more narrow and elongated, being 10 to 11 mm. in length. There are no bristles on the thorax and each of the abdominal segments bears only two pairs of large lateral spines, except the first segment which has only one pair. The breathing horns (Text-fig. 13) are in the same position as in the pupa of *Anisopus*, but they are larger and more chitinous. The slit is circular in outline and a little behind the apex in position. A number of short chitinous tubes open at the surface of this slit. A papilla with a short fine bristle is borne on the side of the breathing horn.

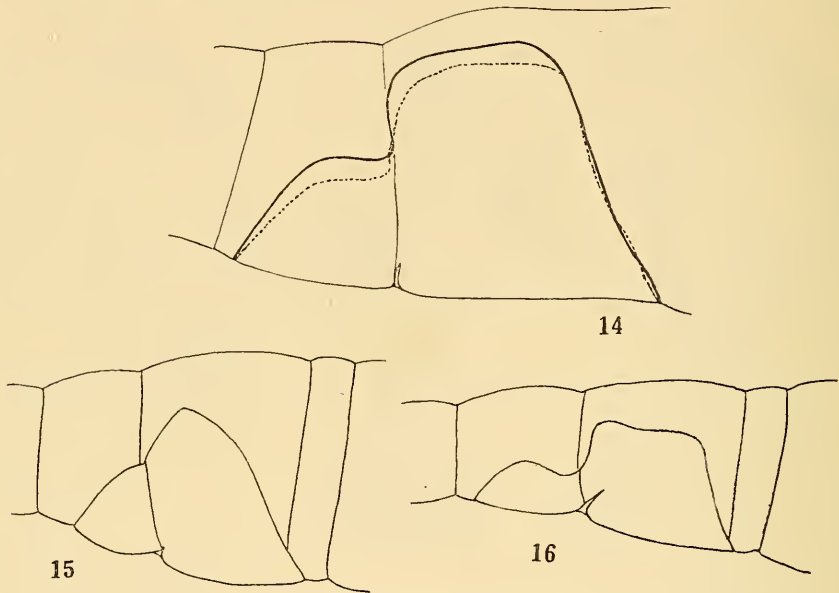
Except for some small differences in detail, the larvae and pupae of *O. insularis* show a close resemblance to those of *O. africanus*, which is the only other species in which the early stages have been described.

Key to adults of the Australian species of Anisopus.

1. Large species; antennae entirely yellow, shading to dark at tip of flagellum; cell R_1 dark except at base *A. neozelandicus* Schin.
Smaller species; antennae entirely dark or only scape yellow; cell R_1 with pale area beyond middle 2
2. Brown species; antennae with yellow scape *A. dubius* Macq.
Black species; antennae entirely black *A. funebris*, n. sp.

Key to larvae of Australian species of Anisopus.

1. Length 17 to 18 mm.; anal plate with conspicuous edges, pointed antero-ventrally, sides of anterior lobe straight (fig. 14) *A. neozelandicus* Schin.
Length 12 to 13 mm.; anal plate without sharply defined edges, more rounded antero-ventrally 2
2. Anal plate with edges of anterior lobe just reaching dorsal surface, sides sharply curved (fig. 15) *A. dubius* Macq.
Anal plate with edges of anterior lobe reaching well on to dorsal surface, sides nearly straight (fig. 16) *A. funebris*, n. sp.



Text-figs. 14-16.—Anal plates.

14.—*Anisopus neozelandicus*, $\times 35$. 15.—*A. dubius*, $\times 35$. 16.—*A. funebris*, $\times 35$.

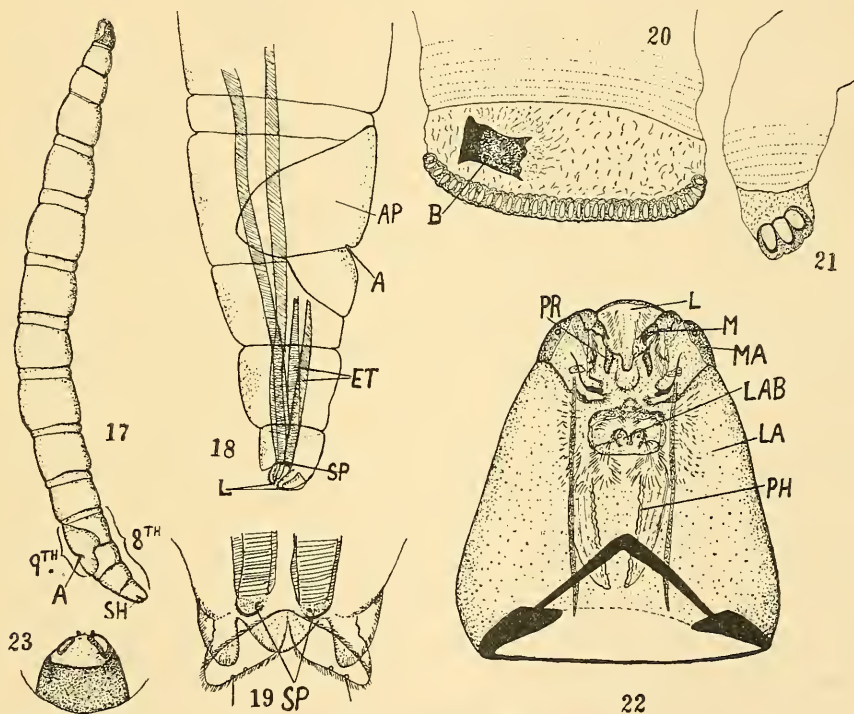
ANISOPUS DUBIUS Macq.

A. dubius Macq. was redescribed in 1919 by Hardy, who also listed the literature and synonymy. Figures of the wing (Text-fig. 31) and genitalia (Text-fig. 36) are included in the present paper to facilitate identification.

The larvae have been found most abundantly in Canberra during July and August in a variety of media, but always under very moist conditions. The flies have always emerged in September from larvae collected at this time. But larvae have also been found occasionally in April, when the adults have appeared in May, June and July. They have been taken in old carcasses, rotting mushrooms, masses of rotting vegetables and hay, and in drains containing manure.

The full-grown larva (Text-fig. 17) is 12 to 13 mm. long, cylindrical, slender and worm-like, tapering at both ends. The body is smooth, devoid of folds or papillae. It is strikingly marked with a brown pigmented pattern. The thoracic segments have an irregular reddish-brown pattern with a series of oval yellow patches. The abdominal segments are more faintly marked with a lighter brown. The head is brown.

The thoracic segments become progressively wider from the first to the third and the sections of the eighth abdominal segment become increasingly narrower towards the terminal end. As in *Olbiogaster*, each of the abdominal segments exhibits a secondary annulation. The first to the seventh appear to have a narrow, creamy-yellow ring between each one. The eighth (Text-fig. 18), however, is divided into four sections, exclusive of the ring between the seventh and eighth, the posterior two of which are produced out past the ninth. The ninth segment is represented by a large ventral plate, the "anal shield" of Keilin, lying beneath the anterior part of the eighth and bearing the anal cleft. This plate (Text-fig. 15) is very readily detached from the rest of the integument and is seen to be considerably broader than the ninth segment of *Olbiogaster*. It is notched, dividing it into two unequal lobes with the anus between. The posterior extremity of the eighth segment bears five short lobes (Text-fig. 19). Two of these lobes are dorsal, bear fringes round the edges, and are longer than the ventral lobes. The ventral pair have a short, wide, median lobe between them. These are not fringed, but are finely grooved or striated round the margins. The spiracles occur at the bottom of a chamber formed by the five terminal processes. They



Text-figs. 17-23.—*Anisopus dubius*.

17.—Larva, $\times 7$. *a*, anus; *sh*, spiracular hollow. 18.—Posterior end of larva, $\times 26$. *ap*, anal plate; *a*, anus; *et*, extra tracheae; *l*, lobes; *sp*, spiracles. 19.—Apex of 8th abdominal segment of larva, $\times 90$. *sp*, spiracles. 20.—Posterior spiracle, $\times 330$. *b*, button. 21.—Anterior spiracle, $\times 330$. 22.—Head of larva, ventral surface, $\times 75$. *l*, labrum; *la*, lateralium; *lab*, labium; *m*, mandible; *ma*, maxilla; *ph*, pharynx; *pr*, premandible. 23.—Antenna, $\times 290$.

are similar in structure to those of *Olbiogaster*, but are less chitinous and of a much shallower crescent shape (Text-fig. 20). The anterior spiracles are smaller than in *Olbiogaster*, having only three clefts (Text-fig. 21).

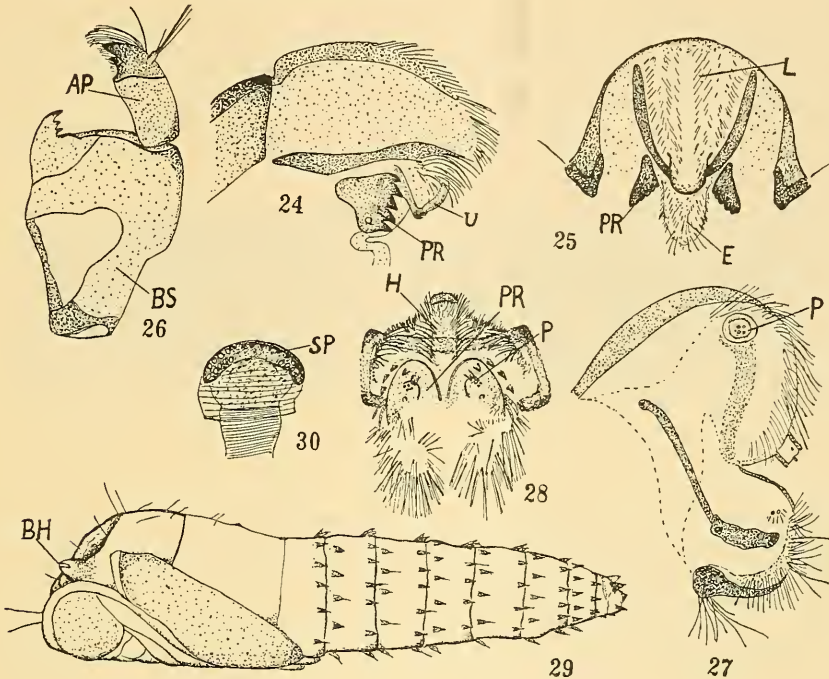
The head (Text-fig. 22) is broadly sub-conical in shape, being strongly convex dorsally and almost flat ventrally. The head-capsule consists of a narrow prefrons which widens a little towards the anterior end, and two side pieces or lateralialia, which curve round and almost meet ventrally. The posterior margin of these is strongly chitinized, particularly ventrally. From the strong ventral margin of each a bar projects into the head, the two meeting medianly to form an arch. The tentorial rods, which run longitudinally inside the head as far as the anterior end of the lateralialia, are connected with these bars. Each side of the prefrons is a small black spot representing the eye. At the inner anterior edge of the lateralialia are the antennae (Text-fig. 23). Each consists of a short mound-like segment, bearing at its summit two flat sensory areas and several tiny papillae.

The mouth parts, although similar in general construction and arrangement to those of *Olbiogaster*, show a marked contrast in details. The labrum (Text-fig. 24) is strongly curved under, continuing into the epipharynx on the ventral surface. The curved dorsal part is smooth and chitinous, whilst the ventral part or epipharynx is densely clothed with hairs. The posterior ventral projection with its U-shaped support is large and conspicuous and bears a tuft of hairs in front. Each side of the labrum and behind the apex are the premandibles (Text-fig. 25). These are more strongly developed than in *Olbiogaster*, each consisting of a small thick plate bearing a row of five teeth along the anterior edge. A strong bar runs along each side of the labrum to the premandibles.

The mandibles (Text-fig. 26) are two-segmented as in *Olbiogaster*. They may also be folded in to lie with their apices facing backwards, or extended in front, when they project before the labrum and are visible from above. They arise from the head near the anterior border of the lateralialia. The basal segment of the mandible is a strong, hollow, almost rectangular sclerite with a deep indentation on the inner face. At the inner anterior corner it is produced to a point and bears three small teeth directed outwards. The apical segment is articulated at the outer anterior corner and is small and narrow. The end is curved inwards and possesses two teeth which are rather obscured by the large tuft of hairs arising from the outer dorsal edge. There is a smaller fringe on the ventral side and a large compound bristle on the outer edge.

The maxillae (Text-fig. 27) are large and composed of thin chitin. They are more hairy than the maxillae of *Olbiogaster*. The outer curved edge is more chitinous than the rest, and the inner edge is fringed with fine hairs for the whole length. A short wide palp projects inwards about the middle of the inner edge. Near the anterior end is a round slightly-raised area bearing a number of minute sensory papillae. The posterior inner edge of the maxilla is densely haired and also bears sensory papillae. There are two chitinous bars as in *Olbiogaster*, but they are thinner and not so well developed. The labium (Text-fig. 28) is much more reduced than in *Olbiogaster*. There is no large chitinous mentum, but simply a thin membranous area occupying a corresponding position and surrounded by fringes and tufts of hair. The prementum is a delicate bi-lobed structure, each lobe bearing five short backwardly-directed cone-like spines on the outer edge and a large flat papilla on the ventral surface. The posterior border is densely haired. The hypopharynx lies above the prementum,

projecting into the head and forwards. It also has a curved border of strong chitin and is itself thin with abundant fringes of short and long hairs.



Text-figs. 24-30.—*Anisopus dubius*.

24.—Labrum-epipharynx, $\times 200$. *pr*, premandible; *u*, U-shaped support. 25.—Labrum-epipharynx, $\times 200$. *e*, epipharynx; *l*, labrum; *pr*, premandible. 26.—Mandible, $\times 200$. *ap*, apical segment; *bs*, basal segment. 27.—Maxilla, $\times 200$. *p*, palp. 28.—Labium, $\times 180$. *h*, hypopharynx; *p*, palp; *pr*, prementum. 29.—Pupa, $\times 12$. *bh*, breathing horn. 30.—Breathing horn of pupa, $\times 95$. *sp*, spiracle.

The pharynx is greatly modified, forming a large organ composed of several plates of thin chitin and tubular structures with striated wavy walls. The whole has the appearance of being a mechanism for straining the liquid food. The tentorium appears to be modified to form a supporting structure for the organ. The rods are connected with a strong arch projecting into the head, the pharynx lying between the rods and above the arch.

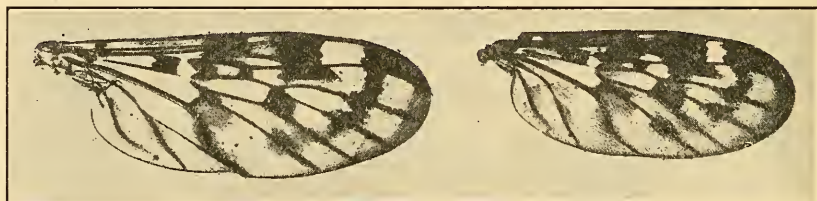
The pupa (Text-fig. 29) is 6 to 7 mm. long and dark brown in colour. The breathing horns (Text-fig. 30) are short, situated behind the antennal sheath and projecting forwards. The curved narrow slit is apical and bears a double row of small round openings. The pupa is truncated anteriorly and narrows to a point posteriorly. There are several pairs of bristles on the back of the thorax whilst the abdominal segments bear a circle of large spines near the posterior margin and a row ventrally and laterally near the anterior margin.

ANISOPUS FUNEBRIS, n. sp.

Female. Length 4 to 5 mm. Wing 4.5 mm. Head small, eyes well separated, black. Face black with greyish sheen, end of palps pale yellowish; frons and

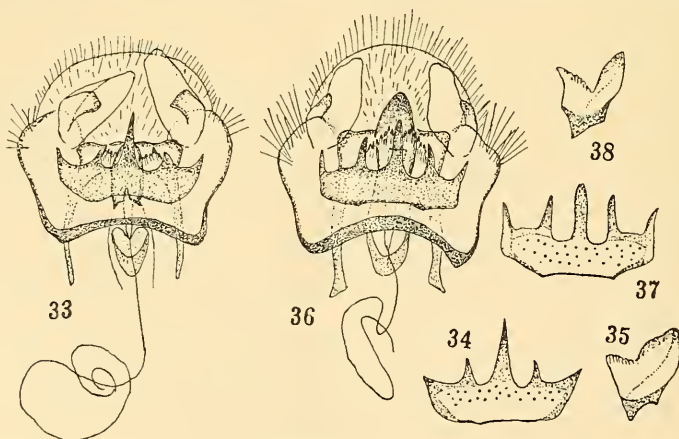
occiput dull velvety black; ocellar tubercle raised, one-third width of frons; occipital bristles black. Antennae entirely black and bristly; same length and form as in *A. dubius*.

Whole of thorax black, except for brownish tinge in front of scutellum; mesonotum dull and velvety with no trace of markings, covered with pale gold to whitish hairs and some black bristles; scutellum black with two long bristles. Wings typical, with macrochetæ and series of blotches, markings being somewhat similar to those in *A. dubius*, but infuscations more extensive and grey to black in colour (Text-figs. 31 and 32). Halteres whitish. Legs dark with ventral

Text-fig. 31.—Wing of *A. dubius*.Text-fig. 32.—Wing of *A. funebris*.

surfaces pale brownish, covered with fine dark bristles; tarsi paler than tibiae, all segments darker at tips; one tibial bristle on foreleg, two on others; fore tibial bristle paler than others. Abdomen narrow and elongate, black; each segment with a narrow colourless posterior border; abdomen covered with whitish to pale gold hairs; genital appendages yellowish.

Male. Similar to female. Head larger, eyes contiguous, facets enlarged at top; ocellar tubercle prominent. Halteres darker than in female, legs slightly paler; hind legs with all but coxae pale brown. Genitalia as figured (Text-figs. 33 to 35). This species is most closely related to *A. dubius*, from which it may be readily distinguished by the characters given in the key and by the genitalia.



Text-figs. 33-38.

33.—Male hypopygium of *A. funebris*, $\times 133$. 34.—Sternal plate of hypopygium, $\times 133$. 35.—Dististyle, $\times 133$. 36.—Male hypopygium of *A. dubius*, $\times 133$. 37.—Sternal plate of hypopygium, $\times 133$. 38.—Dististyle, $\times 133$.

The genitalia of *A. funebris* and *A. dubius* (Text-figs. 36 to 38) appear to differ markedly from those of the species of *Anisopus* figured by Edwards (1923).

Distribution.—Anglesea, Victoria (March, 1934). Bred from *Xanthorrhoea australis*. The holotype male, allotype female and a paratype male and female are in the collection of the Division of Economic Entomology, Canberra.

Larva.—A piece of *Xanthorrhoea* trunk received from Mr. J. H. Bowen from Anglesea, Victoria, in March, 1934, contained a number of larvae and pupae of this species. They were present only in the very moist rotting tissues. The adults emerged within a fortnight.

The larva is of the same size and general appearance as *A. dubius*, and is essentially the same in structure. The pigmentation is slightly different in character from that of *A. dubius*, particularly on the thorax where the colour markings are broader and deeper in tone. The larva of *A. funebris* may, however, be distinguished from that of *A. dubius* by the shape and size of the anal plate. It is larger and curves higher up the sides on to the dorsal surface (Text-fig. 16). The anterior lobe of the plate has also straighter sides, lacking the sharp curve of that in *A. dubius* (Text-fig. 15). The annulations of the eighth segment are more elongate in *A. funebris*, and the terminal papillae slightly longer and more spreading.

Pupa.—There were no obvious differences noted in the pupae of the two species.

ANISOPUS NEOZELANDICUS Schin.

Preserved larvae of this species from Aniseed Valley, N.Z., taken in rot holes in trees by Mr. Tonnoir, were examined, but were not in a suitable condition for description. They were considerably larger than those of the two species described, some reaching 18 mm. in length. They were also distinguishable from the other larvae by the shape and size of the anal plate, as indicated in the key and figure (Text-fig. 14).

DISCUSSION.

The larvae of *Anisopus dubius* show some interesting adaptations to an aquatic environment when compared with the less specialized terrestrial larvae of *Olbiogaster insularis*.

In both species there is a secondary annulation of the abdominal segments, but in *Anisopus* this has been strikingly developed in the eighth segment, which, excluding the intercalary ring, has been divided into four sections, producing it well beyond the ninth. The tendency to produce the eighth abdominal segment beyond the ninth is seen in *Olbiogaster* in the small posterior prolongation of the eighth, which curves round the ninth. This special development of the eighth abdominal segment in *Anisopus* is evidently for the purpose of carrying the highly developed respiratory organ, an adaptation due to its aquatic environment. Martini (1927) points out that in some Psychodid larvae the eighth abdominal segment is entirely dorsal, lying above the ninth, and in Culicine larvae the eighth segment bears a postero-dorsal prolongation, extending beyond the ninth and tenth, and forming the respiratory siphon.

The posterior spiracles are external and unprotected in *Olbiogaster*, whilst in *Anisopus* they occur in a hollow, surrounded and hidden by five lobes which are fringed and striated. The tracheae also show special features in *Anisopus*. In addition to the two main tracheal trunks there is an extra pair of equal size lying below them in the eighth segment. These tracheae coincide with the

main trunks at the spiracles and peter out into thin ends just behind the ninth segment. The four large tracheae are close together and are intimately connected by a network of fine tracheoles, the whole forming a gill-like organ. In living larvae there is always a mass of air bubbles associated with this organ, doubtless allowing the larva to live submerged for considerable periods. In *Olbiogaster* there is a transverse trachea connecting the posterior spiracles just as the anterior spiracles are joined. The air sacs of *Anisopus* may be a modification of this tracheal bridge, which, with the prolongation of the eighth segment, has divided in the middle and formed two short longitudinal trunks.

All the mouth parts are less chitinous and more hairy in *Anisopus* than in *Olbiogaster*, further adaptation to the aquatic habit in the former. *Olbiogaster* has a strongly developed mentum which is absent in *Anisopus*. Both larvae possess two-segmented mandibles, those of *Olbiogaster* being the larger and stronger. In *Anisopus* the premandibles are more distinct and well developed, and the pharynx is peculiarly specialized, forming what appears to be a straining mechanism. The differences in the mouth parts of the two larvae show that *Anisopus* has to obtain its food from liquids, whilst *Olbiogaster* has to deal with solids.

The tentorium of each larva is distinctly different. The lateralia, with their strongly chitinized ventral edges, seem to be the chief head-support in *Olbiogaster*, which possesses in addition only a small chitinous arch in the back of the head. The strong chitinous head is necessary to a larva forcing its way through woody material. *Anisopus*, on the other hand, has thinner chitin forming the epicranium and lateralia, but has a much larger arch extending further forward into the head, and also a pair of longitudinal tentorial rods connected with the arch near their posterior ends. This specialized tentorium is doubtless a support for the highly developed pharynx.

The above comparison indicates how the chief differences in structure of the larvae of *A. dubius* and *O. insularis* are closely related to differences in environment. On larval structure *Mycetobia* (Keilin, 1919) is closer to *Anisopus* than is *Olbiogaster*, but adult characters place *Olbiogaster* closer than *Mycetobia* to *Anisopus*. The reason for this is that the larvae of *Mycetobia* and *Anisopus* live under similar conditions whilst those of *Olbiogaster* have a different habitat.

Hence, within the family Anisopodidae, larval characters should be used circumspectly in assessing systematic relationships, as they are largely expressions of environmental influences.

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